4511

ORDER NO. SD8002-1670

Service Manual

Stereo Integrated DC Amplifier

SU-V6

[M], [MC]

Areas

[M] is available in U.S.A.
[MC] is available in Canada.

TECHNICAL SPECIFICATIONS (Specifications are subject to change without notice for further improvement.)

(IHF '78)

AMPLIFIER SECTION

Rated minimum sine wave RMS power output
20 Hz~20 kHz both channels driven
0.007 % total harmonic distortion
70 W per channel (8 ohms)
20 Hz~20 kHz both channels driven
0.02 % total harmonic distortion
80 W per channel (4 ohms)

1 kHz continuous power output	
both channels driven	
0.007 % total harmonic distortion	75 W per channel (8 ohms)
0.01 % total harmonic distortion	90 W per channel (4 ohms)
Dynamic headroom	1.6 dB (8 ohms)
	2 dB (4 ohms)
Total harmonic distortion	
rated power at 20 Hz~20 kHz	0.007 % (8 ohms)
half power at 20 Hz~20 kHz	0.007 % (8 ohms)
half power at 1 kHz	0.003 % (8 ohms)
SMPTE Intermodulation distortion	0.007 %
Low frequency damping factor	60 (8 ohms)
	30 (4 ohms)
Load impedance	
MAIN or REMOTE	4~16 ohms
MAIN and REMOTE	8~16 ohms
Frequency response (1 W output)	
PHONO	RIAA standard curve ±0.5 dB
TUNER AUX	20 Hz~20 kHz, +0 dB, −0.3 dB
(STRAIGHT. D,C)	DC~150 kHz, −3 dB
Input sensitivity	
PHONO MM	0.3 mV (2.5 mV, IHF '66)
MC	23 μV (170 μV, IHF '66)
TUNER, AUX, TAPE	18 mV (150 mV, IHF '66)
S/N (IHF, A)	
PHONO MM	77 dB (86 dB, IHF '66)
MC	74 dB (68 dB, IHF '66, 250 μV input)
TUNER, AUX	81 dB (106 dB, IHF '66)
Maximum input voltage	
PHONO MM	130 mV (150 mV, 1 kHz)
MC	9 mV (10 mV, 1 kHz)
Input impedance	
PHONO MM	47 kilohms
MC	47 ohms
TUNER, AUX, TAPE	47 kilohms
Tone controls	
BASS	50 Hz, +10 dB~ −10 dB
TREBLE	20 kHz, +10 dB~ −10 dB
Subsonic filter	20 Hz, −12 dB/oct.
High filter	7 kHz, −6 dB/oct.
Loudness control (volume at −30 dB)	50 Hz, +7 dB
Muting	−20 dB
Output voltage	
TAPE 1, 2 REC OUT	150 mV

GENERAL

Power consumption	400 W, 490 VA
Power supply	AC 120V, 60 Hz
Dimensions (W×H×D)	430 × 153 × 351 mm
	(16-15/16" × 6-1/32" × 13-13/16")
Weight	12.5 kg
	(27.6 lb.)

Note:
Total harmonic distortion are measured by the digital spectrum analyzer (HP. 3045 system).

Weights and dimensions shown are approximate.

Technics

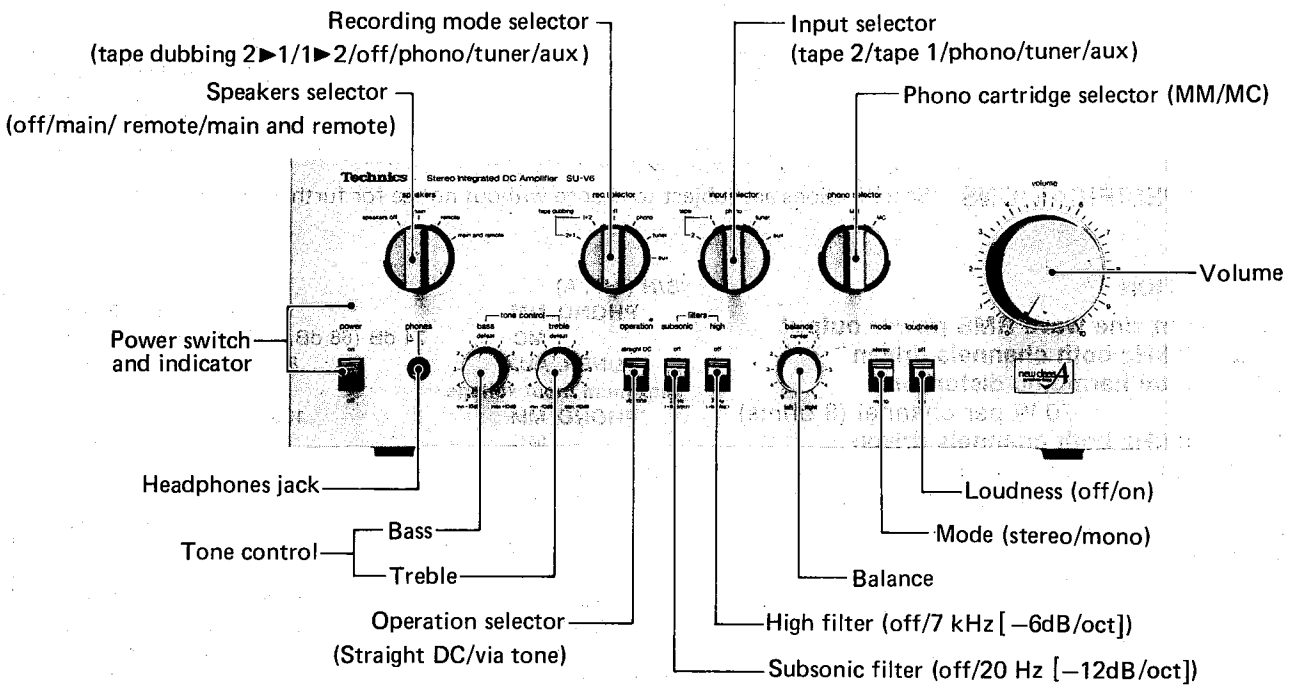
Panasonic Company
Division of Matsushita Electric
Corporation of America
One Panasonic Way, Secaucus,
New Jersey 07094

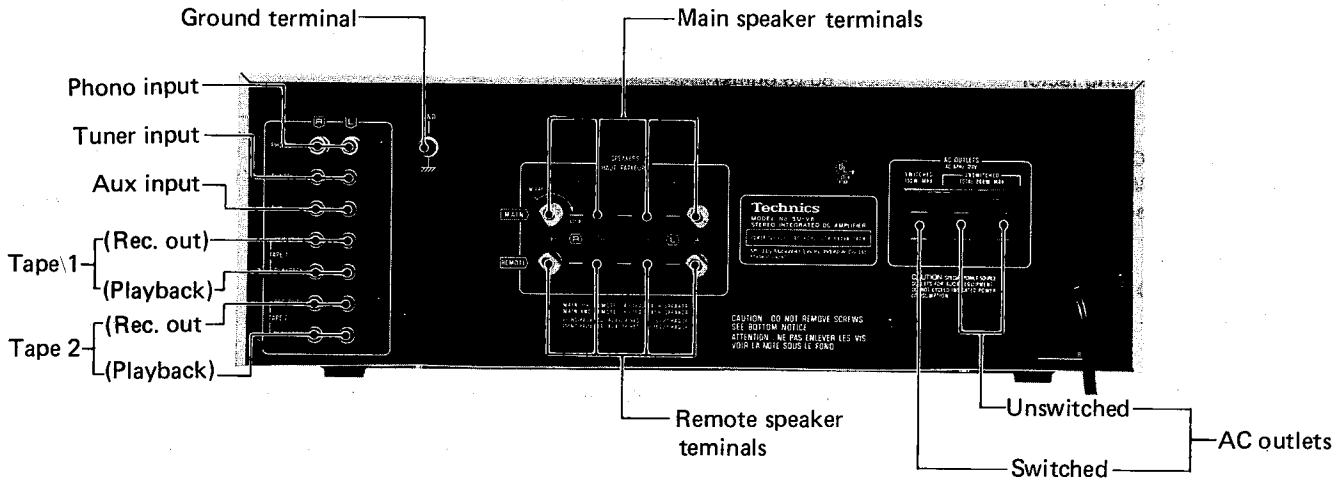
Panasonic Hawaii, Inc.
320 Waiakamilo Road, Honolulu,
Hawaii 96817

Matsushita Electric of Canada Ltd.
5770 Ambler Drive,
Mississauga, Ontario L4W 2T3

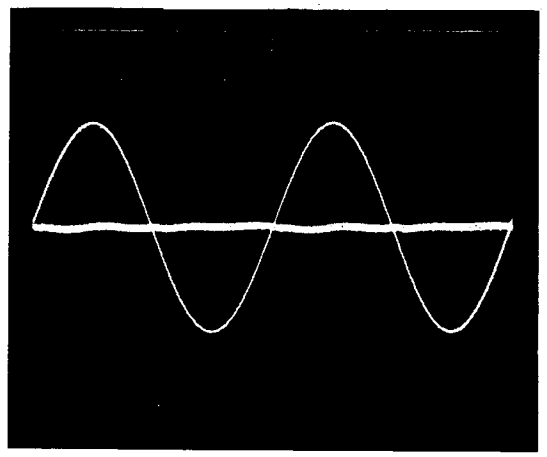
■ CONTENTS

■ LOCATION OF CONTROLS

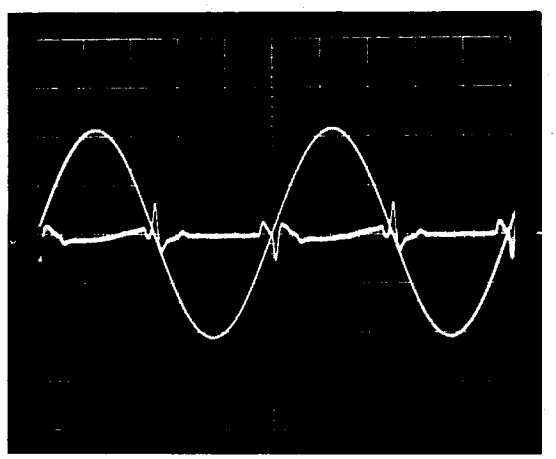




• **Output signal and distortion wave forms**



(New Class A amplifier)
Photo 3



(Class B amplifier)
Photo 4

■ TECHNICAL INSTRUCTIONS

The following diagram indicates the synchronous bias circuit of this unit. (The diagram shown is only for the righ channel, but it is identical for the left channel). The first stage consists of a differential circuit (Q306), a current mirror load (Q304) and an emitter follower (Q308). The driver circuit consists of the voltage amplifier stage (Q310) having current stabilizer load (Q312) and the SEPP voltage amplifier stage (Q614, Q616). Its emitter follower output works as a Class A amplifier by bias 1. This in turn is connected to the SEPP final stage of the Darlington output circuit through the synchronous bias circuit by bias 2 and 3. We can consider this a three-stage-Darlington output circuit, where a synchronous bias circuit is inserted between the first SEPP Class A amplifier and the second SEPP stage.
Bias 2 and 3 are the circuits that prevent the output stage on the positive (⊕) side (for bias 2) and on the negative (⊖) side (for bias 3) from turning OFF during the reproduction of any signals. Both operate on fixed current with the voltage set at the value of V_F 2.

- **When no signal exists:**
  The idling current (I_{CQ}) of output transistors (Q622, Q624) is the sum of the current I_{CQ} 1 determined by bias 1 and the current I_{CQ} 2 determined by bias 2 and bias 3.

  That is, $I_{CQ} = I_{CQ}\,1 + I_{CQ}\,2$

  where, $$I_{CQ}\,1 = \frac{V_F\,1 - (V_{BE}\,1 + V_{BE}\,2 + V_{BE}\,3 + V_{BE}\,4 + V_{BE}\,5 + V_{BE}\,6 + V_D\,1 + V_D\,2)}{2R_E}$$
  $$I_{CQ}\,2 = \frac{2V_F\,2 - (V_{BE}\,3 + V_{BE}\,4 + V_{BE}\,5 + V_{BE}\,6 + V_D\,3 + V_D\,4)}{2R_E}$$

- **When signals are applied:**
  When signals swing to the positive (⊕) side, the current Io flows into the output stage (Q622) on the positive (⊕) side, generating a voltage R_E Io at the emitter resistor R_E. This reduces the collector current on the negative (⊖) side of the output stage due to bias 1. Since bias 3 acts as a fixed voltage source, bias is applied to the negative (⊖) side transistors Q620 and Q624, and I_{CQ}2 keeps flowing. That is, the negative (⊖) side output stage continues to operate without being cut-off. When the signals swing to the negative (⊖) side, the positive (⊕) side output stage remains operating in exactly the same way due to bias 2. That is, the signals are reproduced without switching.
  In the synchronous bias circuit, high speed diodes which can follow precisely and correctly the high frequency signals are used for D610 and D612 where the signals pass through and for D614 and D616 where the current flows to pass the signals without switching at the time of signal reproduction.

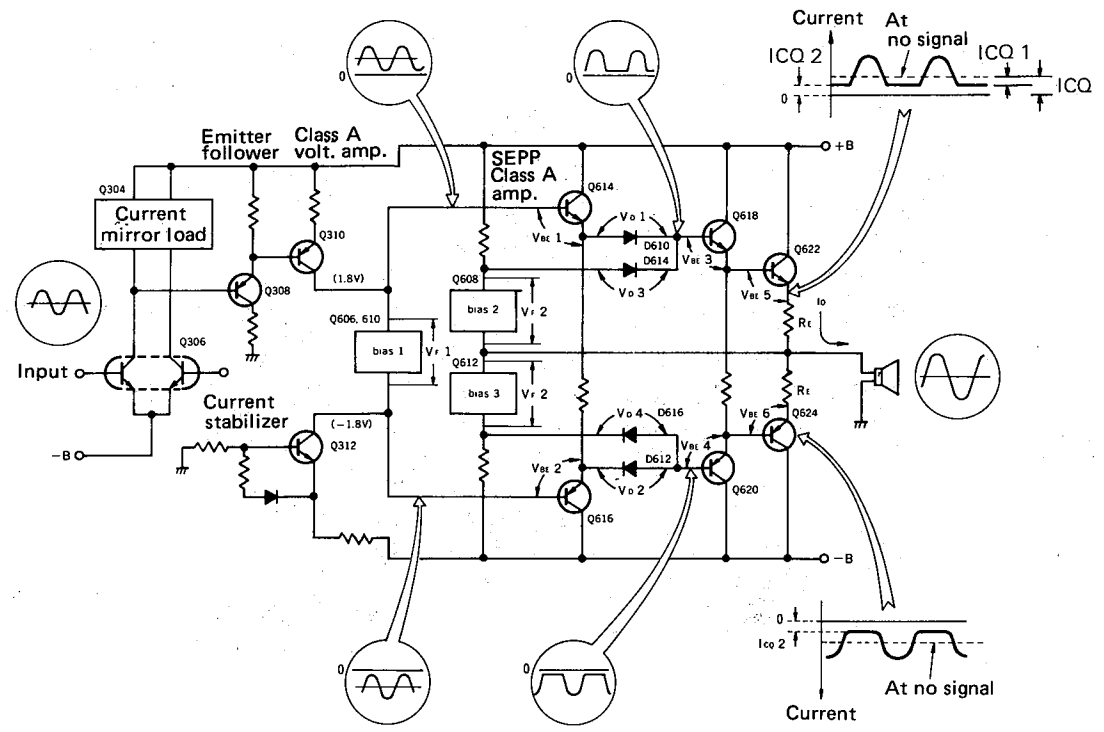
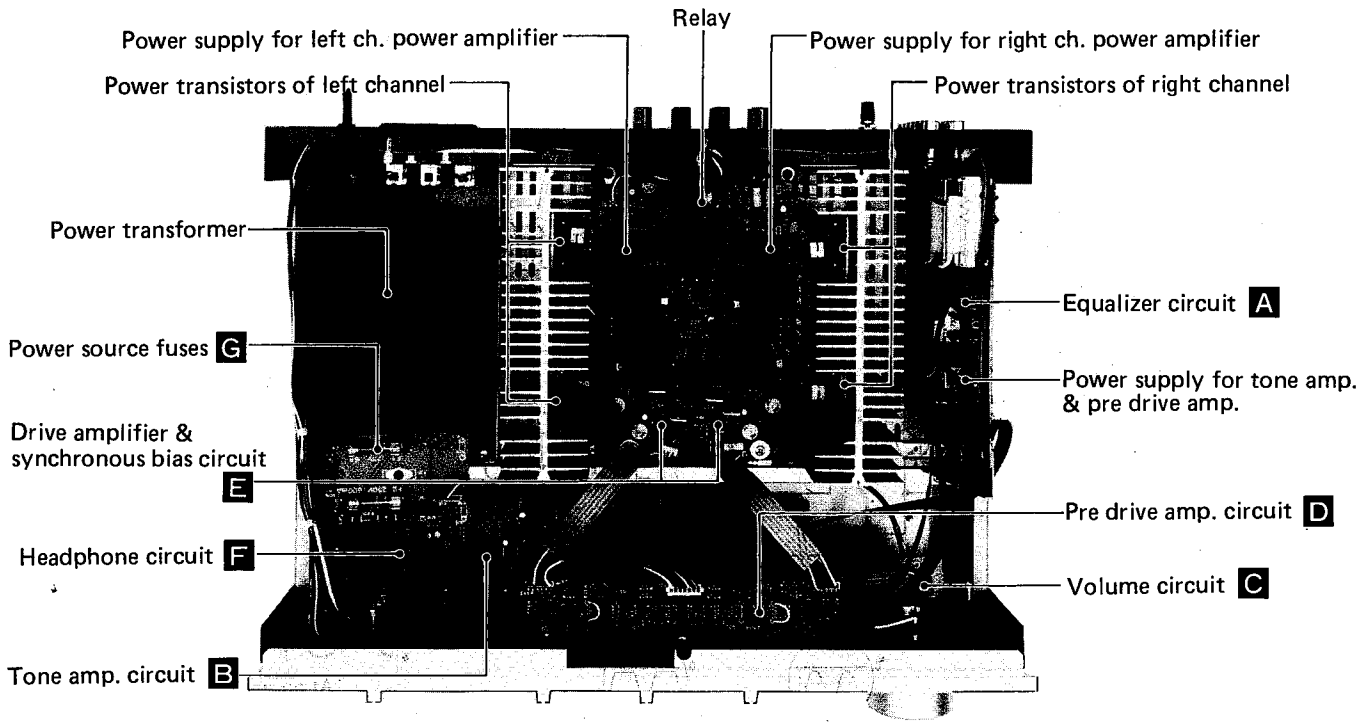


Fig. 5

- **Operational check of synchronous bias circuit**
  To check the operation of the synchronous bias circuit:
  1. Measure the emitter current with an oscilloscope connected to the emitter of output transistor.
  2. Turn the bias 2 and bias 3 (R659 in left channel; semi-fixed volume for clamp voltage adjustment of R660 in right channel), then the operation is normal if I_{CQ} 2 operates.
  3. If the circuits of bias 2 and 3 are not in operation, the operation will be the same as in a conventional Class B amplifier where switching distortion is generated.



■ OUTLINE OF THIS UNIT

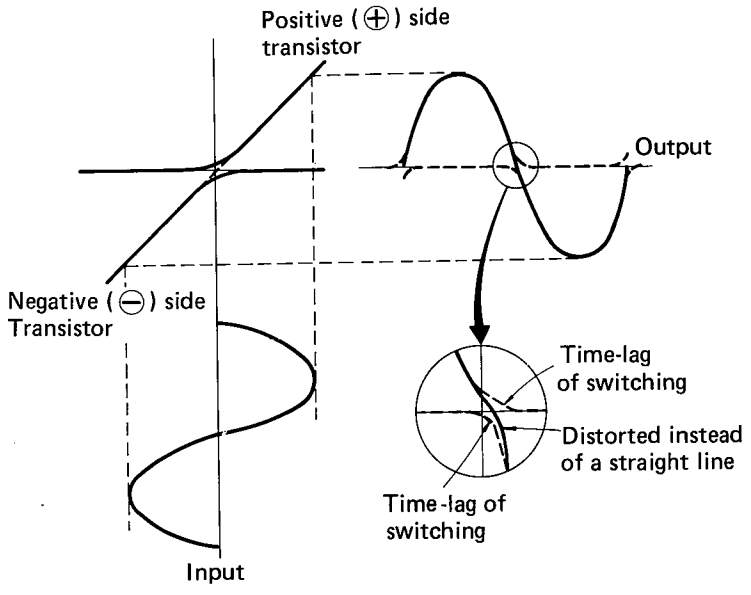
In the world of amplifiers, the sound-quality and the output have been the two contradictory concepts. To obtain inproved sound-quality within a limited budget the tendency is to lower the power output, on the other hand, larger output means a sacrifice in sound quality. Therefore, if better sound quality is required, it is beneficial to adopt Class A amplification method, and if large output power is desired, it si wise to select Class B amplification method. This unit has employed the New Class A method to obtain a high output of 70W per channel with a distortion rate of 0.007% (For an 8 ohms load at rated output of 20Hz ~ 20kHz). This low cost stereo integrated amplifier, considering its high output, was developed as a successful combination of fine sound quality and high power output.

• Class B amplification and Class A amplification

1. Class B amplification

Although Class B amplification has high power efficiency, it invariably introduces switching distortion due to its operating principle. As shwon in Fig. 1, a transistor on the positive (⊕) side amplifies the positive half of the signal, while a transistor on the negative (⊖) side amplifies the negative half of the signal.

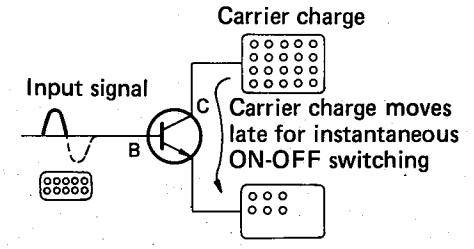
Since only one transistor on either ⊕ or ⊖ side works at any given time, less heat is generated and the power efficiency is higher. However, the switching process is not a smooth one between ⊕ and ⊖ or between ⊖ and ⊕, resulting in distortion. The faster the speed of a signal (higher frequency) is, (as shown in Fig. 2) the more difficult it is for the transistor to catch up instantaneously and the later the carrier charge on the output sides moves (distorted). In recent years, new transistors were developed which can respond to high speeds at high frequencies and which help to improve the distortion greatly though it is difficult to eliminate the distortion completely .



(Operation of Class B amplifier)
Fig. 1

2. Class A amplification

As the transistors on positive (⊕) and negative (⊖) sides amplify signals continuously, switching is not necessary. Accordingly, no switching distortion exists. However, power efficiency becomes very low because this method requires a large current even when there is no signal to be amplified and more heat is generated.



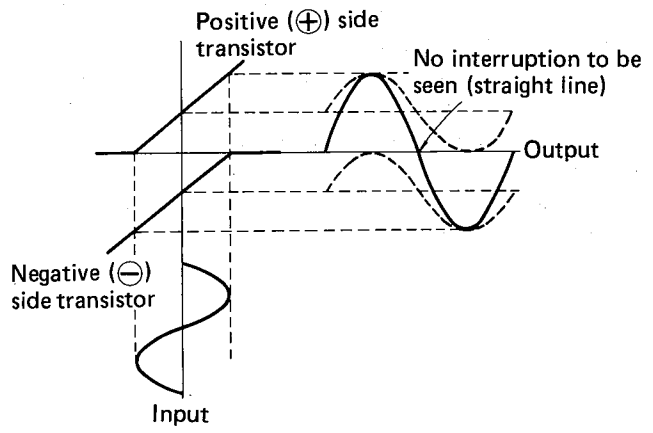
(Transition of electric charge inside the transistor)
Fig.2

• New Class A amplification method

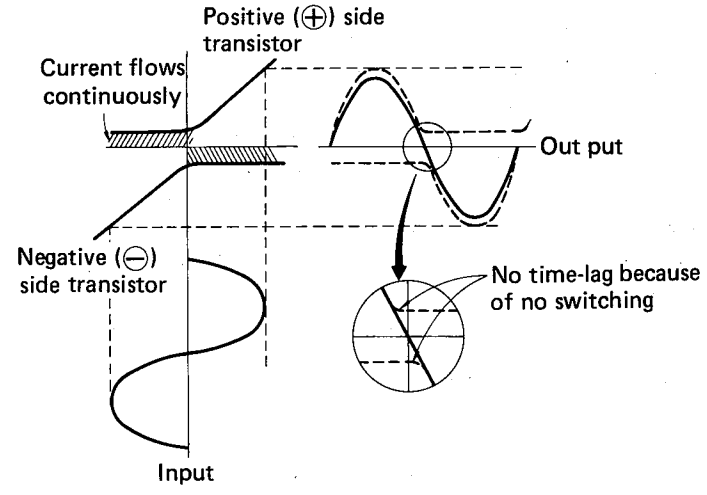
This method combines and utilizes the advantages of Class A, B, or Class AB amplification methods to eliminate distortion and to assure almost equal power efficiency to that of the Class B amplification.

The function of the synchronous bias circuit allows a certain constant flow of current in transistors on the positive (⊕) and negative (⊖) sides, the output transistors are never turned OFF while reproducing any signals, and the distortion caused by switching is therefore eliminated.

Photos 1 ~ 4 show performance comparisons between Class B and the New class A amplifier. Photos 1 and 2 indicate collector current wave forms at their output stages on the positive (⊕) side and negative (⊖) side. (Output transistors are not turned OFF in the case of New Class A.) Output signal wave forms and distortion wave forms are shown in Photos 3 and 4.

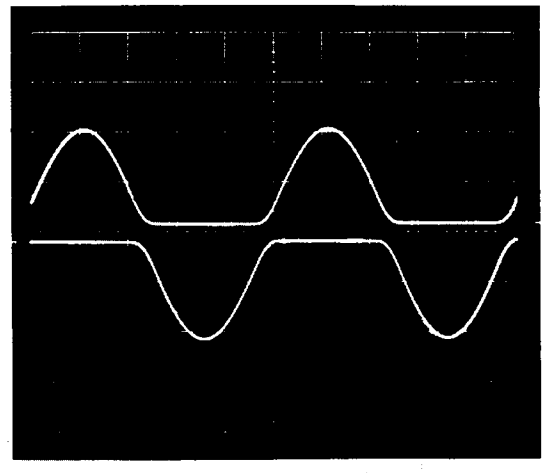


(Operation of Class A amplifier)
Fig. 3

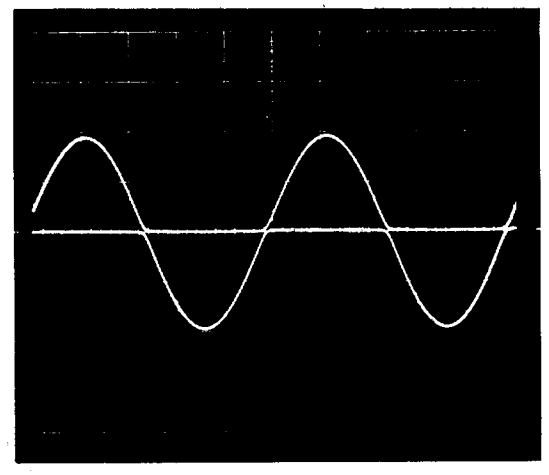


(Operation of New Class A amplifier)
Fig. 4

• Collector current wave forms



(New Class A amplifier)
Photo 1



(Class B amplifier)
Photo 2

■ ADJUSTING INSTRUCTIONS

- **Setting of controls and instruments to be used**

1. Operation switch . . . . . straight DC
2. Speaker switch . . . . . .main
3. Sound volume . . . . . .0 (minimum)
4. DC voltmeter (capable to measure 5mV)

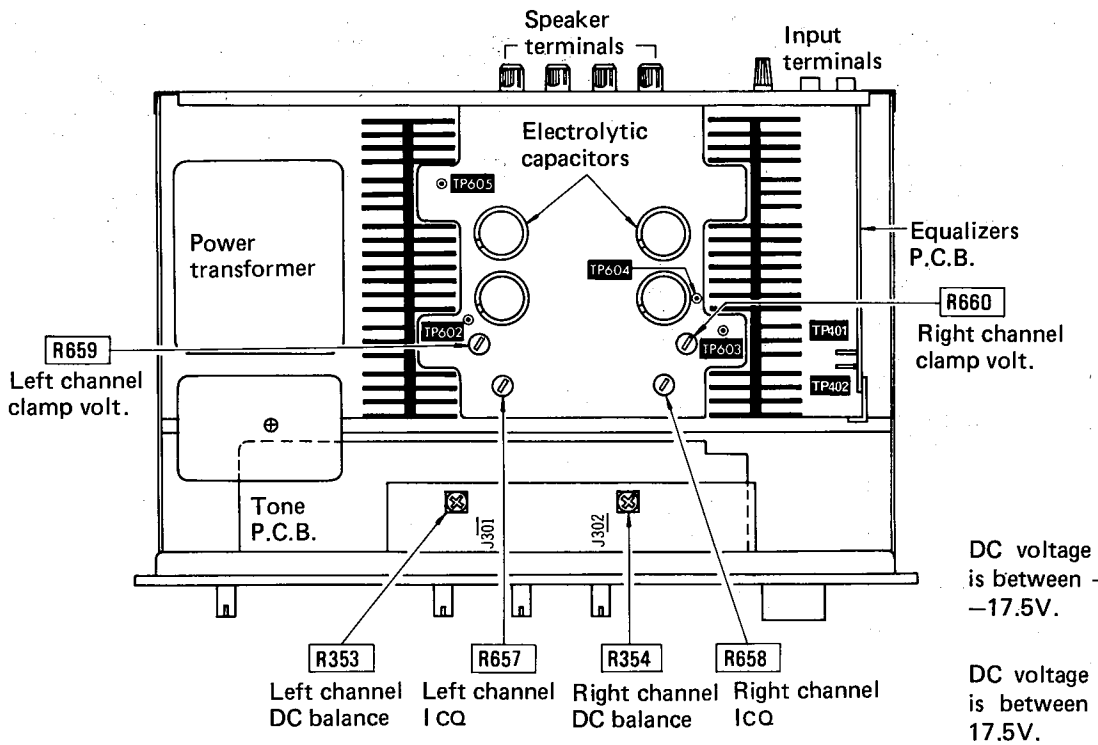
No.	Adjustments	DC Voltmeter Connections	Adjusting Point	Adjustment Procedure
1	DC Balance	L channel Between TP602 and ground	R353	• Adjust R353 to obtain a minimum reading, using the 100mV range on the DC voltmeter (within ±10mV) • Cut off the jumper wire (J301) if adjustment is not possible.
2		R channel Between TP604 and ground	R354	• Adjust R354 to obtain a minimum reading, using the 100mV range on the DC voltmeter. • Cut off the jumper wire (J302) if adjustment is not possible.
3	Clamp Voltage	L channel Between TP605 and TP602 (minus probe) R channel Between TP604 and TP603 (minus probe)	R659 (L channel) R660 (R channel)	• Turn ICQ semi-fixed resistors R657, 658 to minimum. (counter-clockwise direction) • Adjust R659 (Lch) and R660 (Rch) to approx. 1mV after ten minutes warm-up time.
4	ICQ (Adjustment using a DC voltmeter)	L channel Between TP605 and TP602 (minus probe) R channel Between TP604 and TP603 (minus probe)	R657 (L channel) R658 (R channel)	• Adjust R657 (L ch) and R658 (R ch) to approx. 10 ~ 15mV after ten minutes warm-up time.

- **ICQ can be adjusted with oscilloscope and the distortion analyser.**

Instruments to be used

1. Oscillator (20kHz sine wave)
2. Distortion analyser
3. Oscilloscope

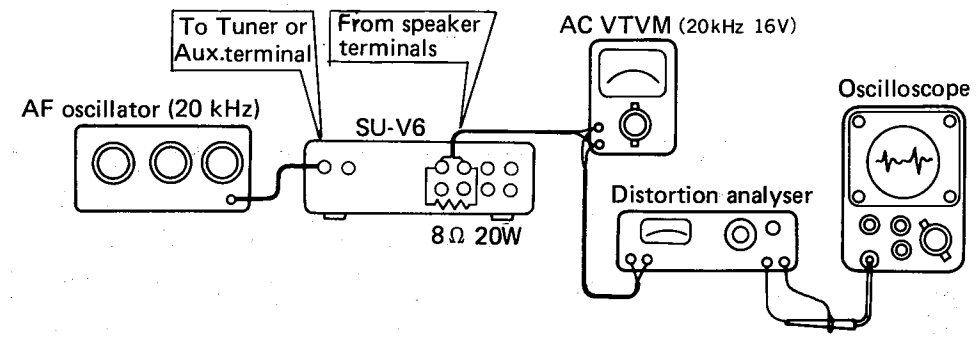
1st Feed 20kHz sine wave into the TUNER or AUX terminals.
2nd Volume control to maximum of this unit.
3rd Connect the distortion analyser to the speaker terminals and connect the output from the distortion analyser to the vertical input of the oscilloscope.
4th Turn the oscillator attenuater so that the output at the speaker terminal reaches 16V.
5th Adjust the ICQ semi-fixed resistors R657 (left channel), R658 (right channel) for minimum distortion on the oscilloscope.



DC voltage at TP401 is between −14.5V and −17.5V.

DC voltage at TP402 is between 14.5V and 17.5V.

Fig. 6



(I CQ adjustment with the oscilloscope and the distortion analyser)
Fig. 7

■ DISASSEMBLY INSTRUCTIONS

- **To remove power Transistor** (example:left channel)

1. Unsolder Power Transistor.
2. Loosen two screws (① and ② as shown in Fig. 8) which hold the heat sink onto the foil side of the P C B.
3. Loosen plastic revets which hold the bias circuit PCB's (Q605, 607, 609 and 611) to the heat sink. The PCB's are about 1'' x 1.5''(25 x 35mm) insize.
4. Lift the heat sink from the chassis and loosen two screws to remove the power transistor.
5. When replacing the transistor, apply silicone grease to the bottom of the transistor and reverse the procedure (steps 4 through 1).

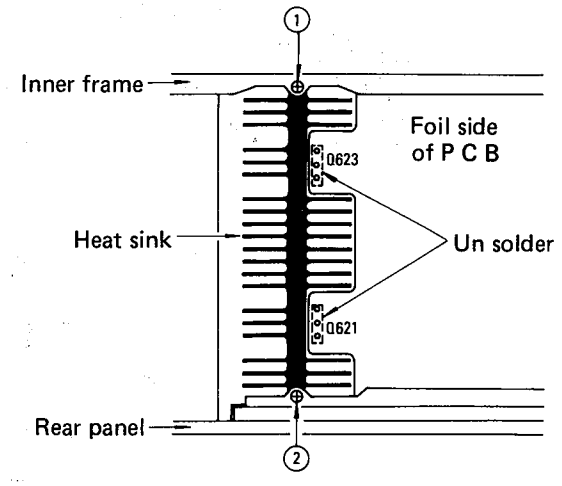


Fig. 8

- **To remove the remote control switch band**

1. Press the band with a screw driver in the direction shown in Fig. 9.
2. Remove the band, first at point Ⓐ as shown in Fig. 10. (Care should be taken not to hold Ⓒ in Fig. 9.)
3. Then remove the band at point Ⓑ.
4. When re-attaching the band start at point Ⓑ.

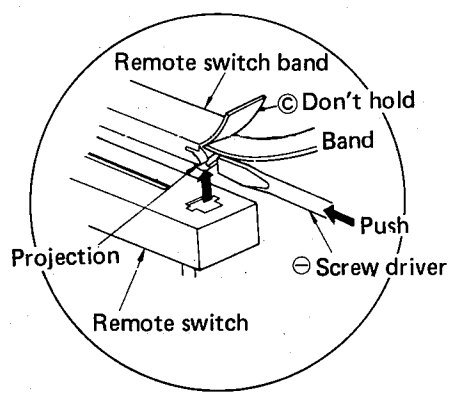


Fig. 9

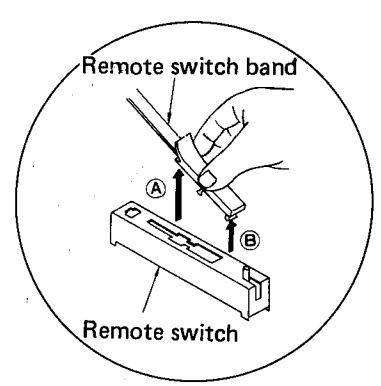
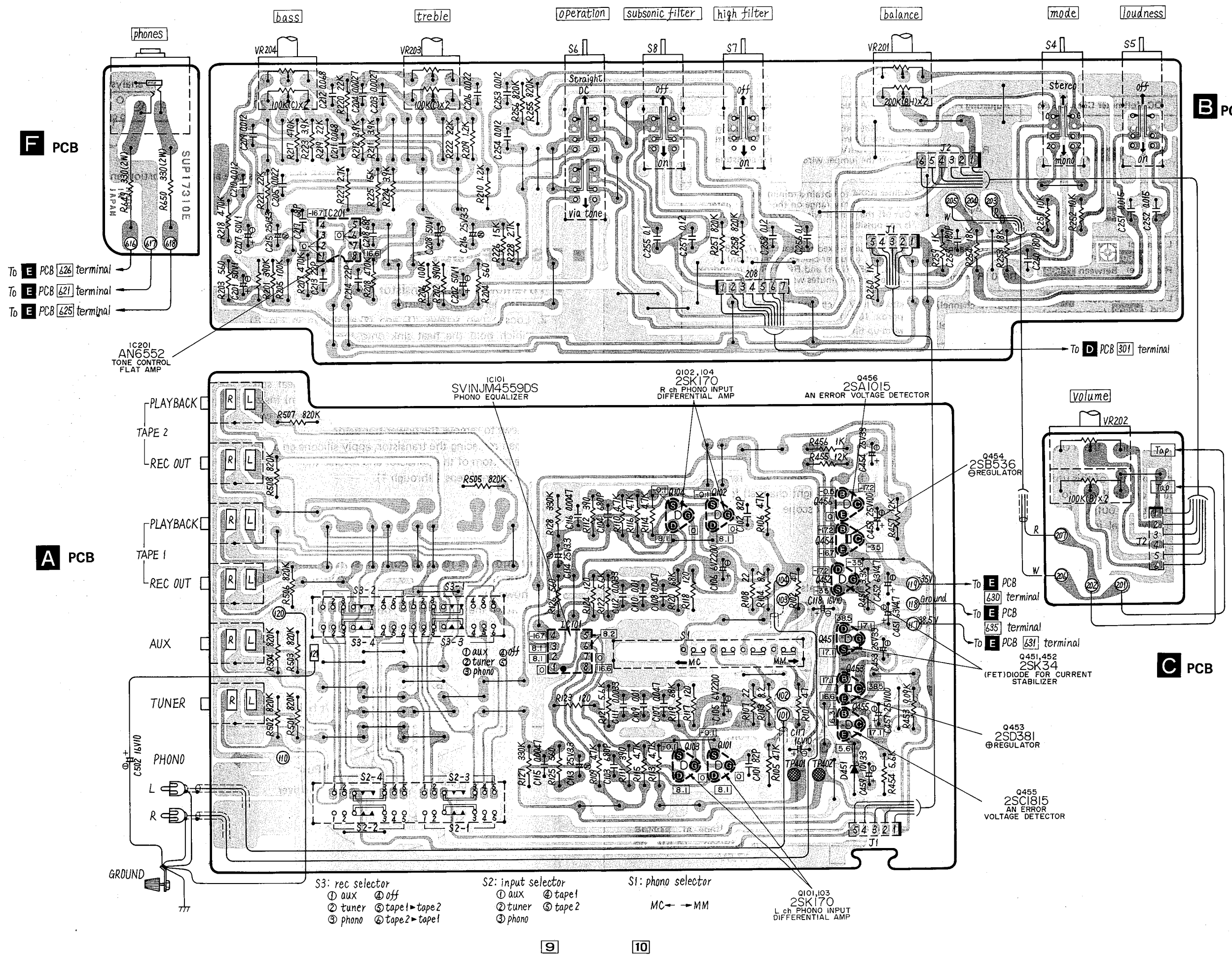


Fig. 10

■ PRINTED CIRCUIT BOARD

(A Equalizer/Voltage regulator, B Tone control, C Volume control, F Headphone circuit)

Ground (Earth) circuit



■ SCHEMATIC DIAGRAM

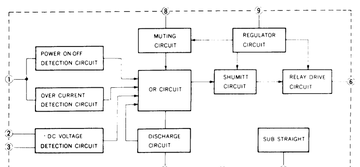
(This schematic diagram may be modified at any time with the development of new technology.)

Notes:

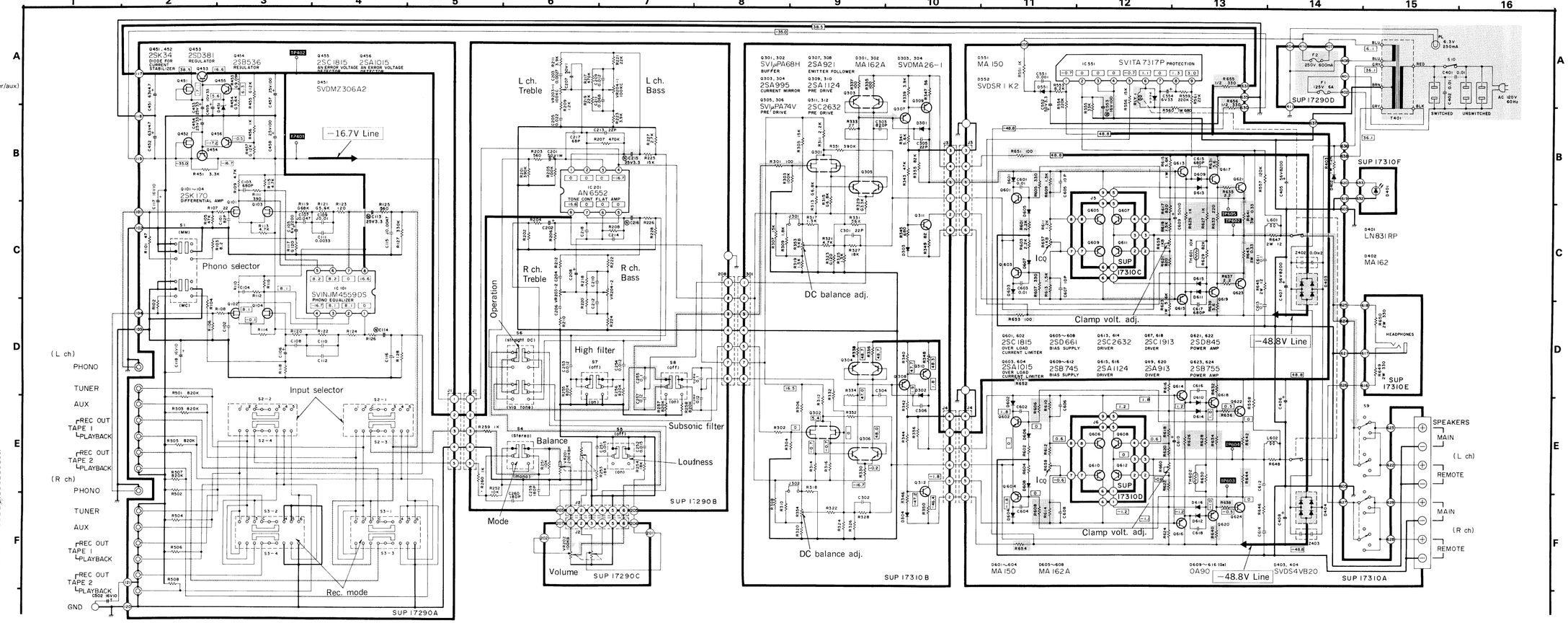
1. **S1**: Phono cartridge selector switch in **"MM"** position. (MM/MC)
2. **S2**: Input selector switch in **"phono"** position. (tape 2/tape 1/phono/tuner/aux)
3. **S3**: Recording mode selector switch in **"phono"** position. (tape dubbing 2 ► 1/tape dubbing 1 ► 2/off/phono/tuner/aux)
4. **S4**: Mode switch in **"stereo"** position. (stereo/mono)
5. **S5**: Loudness switch in **"off"** position.
6. **S6**: Operation selector switch in **"straight DC"** position. (Straight DC/via tone)
7. **S7**: High filter switch in **"off"** position. (off/7kHz [–6dB/oct])
8. **S8**: Subsonic filter switch in **"off"** position. (off/20Hz [–12dB/oct])
9. **S9**: Speakers selector switch in **"main"** position. (off/main/remote/main and remote)
10. **S10**: Power source switch in **"on"** position
11. ▭ Indicated voltage values are the standard values for the DC electronic circuit tester (high impedance) with the chassis taken as standard. Therefore, there may exist some errors in the voltage values, depending on the internal impedance of the DC circuit tester.
12. ═══ Phono signal lines of left channel
13. ▬▬ Positive (+ B) voltage lines

IMPORTANT SAFETY NOTICE

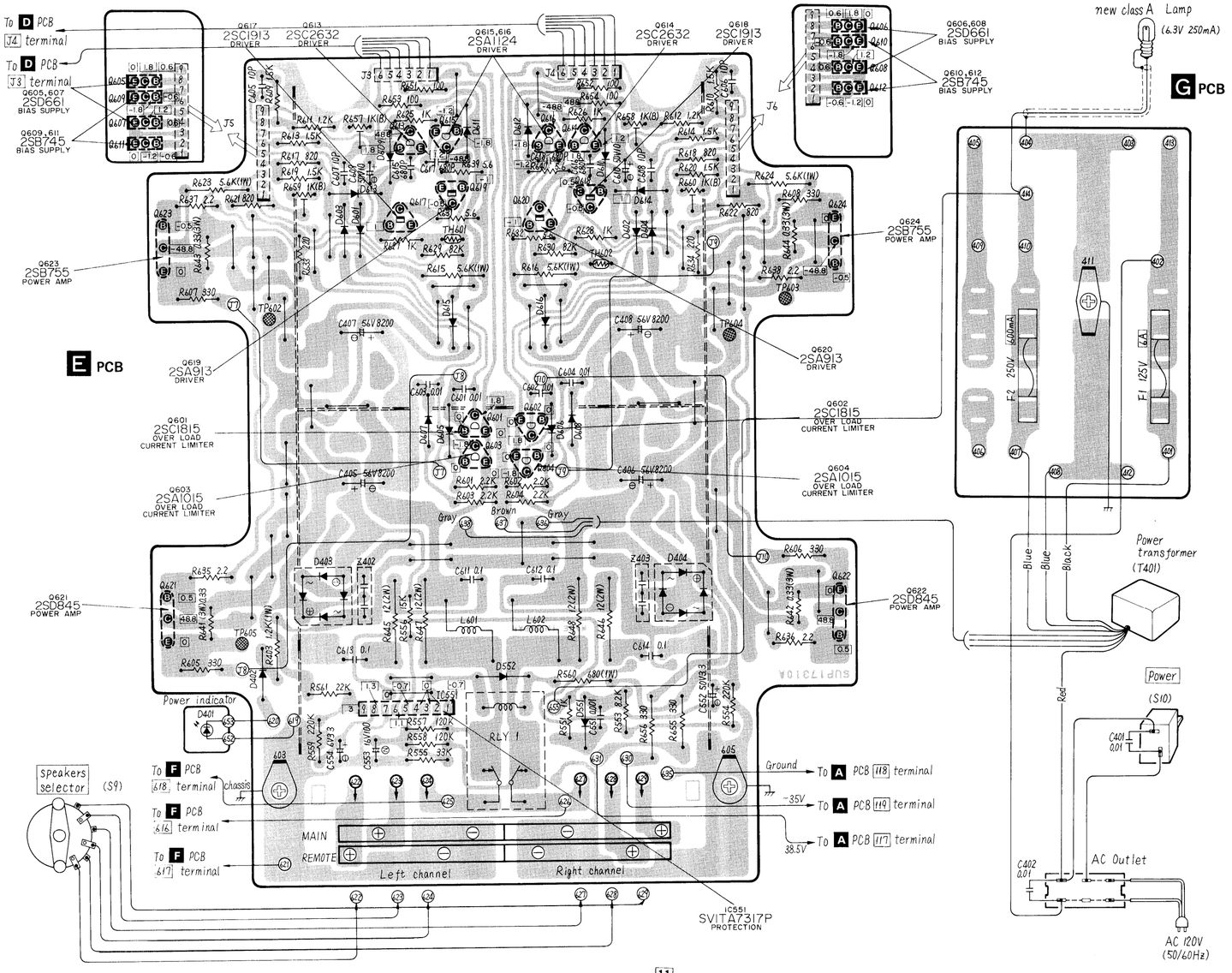
THE SHADED AREA ON THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR SAFETY. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURER SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SHADED AREAS OF THE SCHEMATIC.



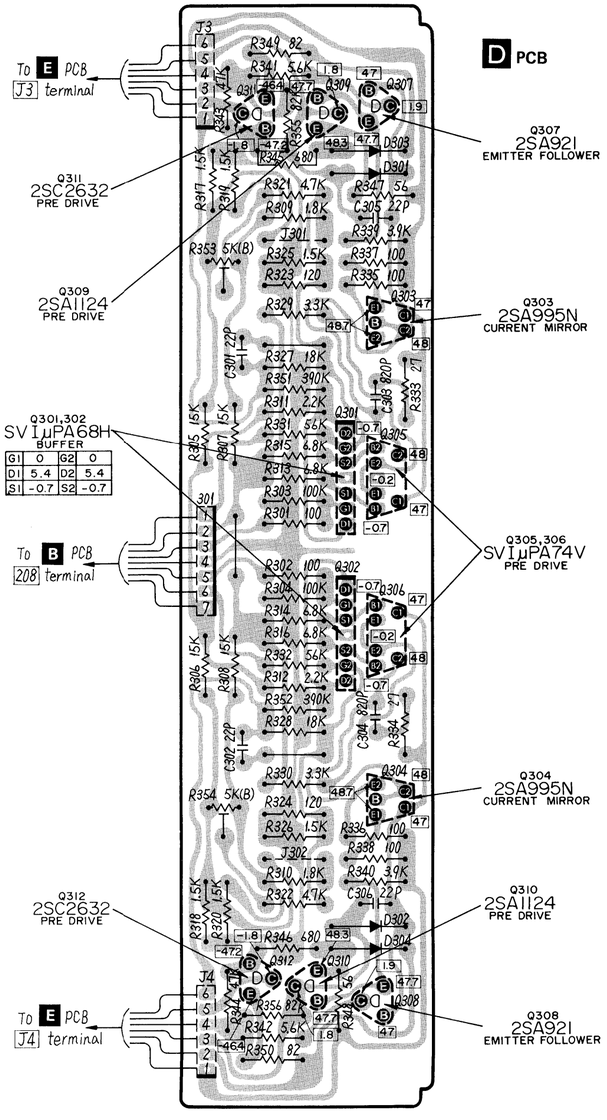
IC551 (SVITA7317P) Speaker protection & muting



■ PRINTED CIRCUIT BOARD (E Power amplifier drive & synchronous bias circuits, G Power source fuse)



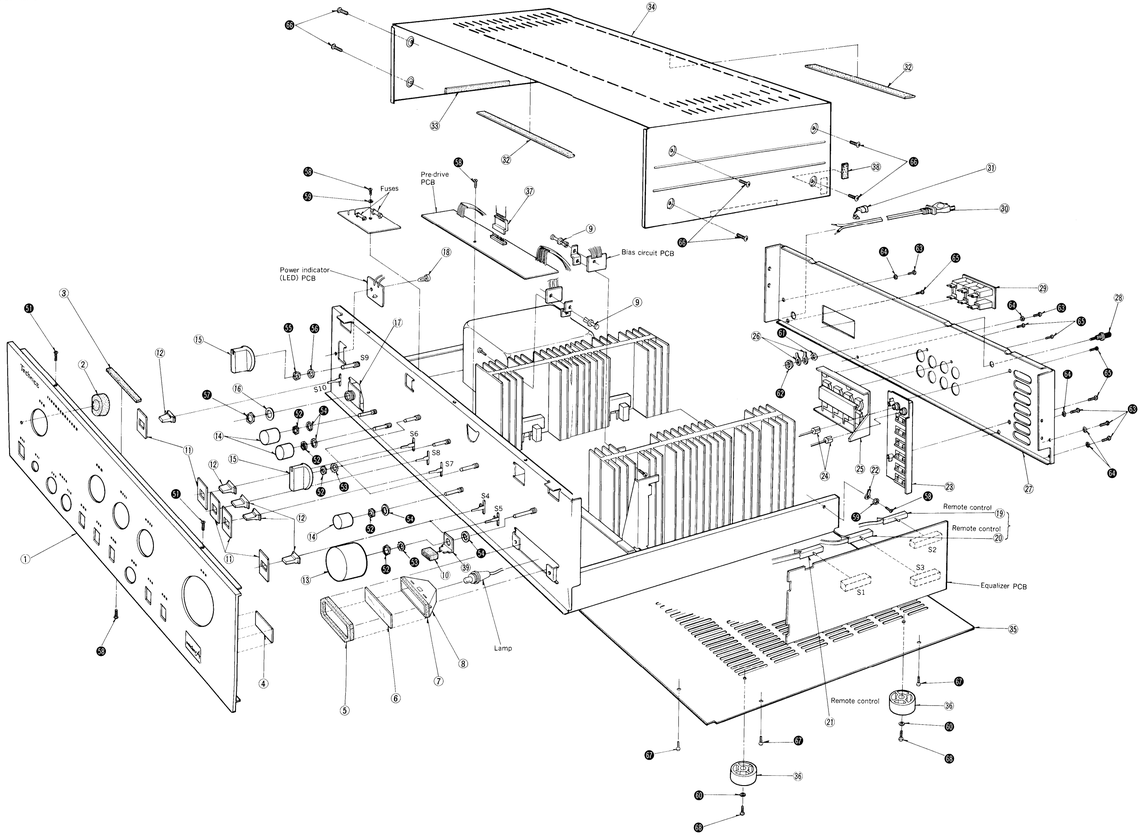
■ PRINTED CIRCUIT BOARD (D Pre drive circuit)



- Terminal guide of transistors and IC's

2SA921 2SA1124 2SA1015 2SC1015 2SC2632	2SD381 2SB536
2SK34	2SKI70
SV1μPA68H	SVITA7317P
2SA995	2SA913 2SC1913
2SB745 2SD661	2SB755 2SD845
AN6552	SVINJM4559DS
SV1μPA74V	① Base 1 ② Collector 1 ③ Emitter 1 ④ N.C. ⑤ Sub ⑥ N.C. ⑦ Emitter 2 ⑧ Collector 2 ⑨ Base 2

■ EXPLODED VIEW



■ REPLACEMENT PARTS LIST (Cabinet and Chassis Parts)

Notes: 1. Part numbers are indicated on most mechanical parts. Please use this part number for parts orders.
2. △ indicates that only parts specified by the manufacture be used for safety.
3. Bracketed indications in Ref. No. columns specify the area. Parts without these indications can be used for all areas.

[M] is available in U.S.A.
[MC] is available in Canada.

Ref. No.		Part No.	Part Name & Description
CABINET and CHASSIS PARTS			
1		SGWUV6M	Panel, Front Ass'y
2		SHG1481	Cover, Power Indicator
3		SHG6063–1	Rubber Magnet
4		SDU27	Filter, New Class A Badge
5		SHG6089	Cover, New Class A Bagde
6		SDE251	Filter, New Class A Badge
7		SHG6111	Fiber, New Class A Badge
8		SMP281	Holder, New Class A Badge Lamp
9		SHR401–1	Latch, P.C.B. M'tg
10		SHG515	Cushion, Volume Stopper (Rubber)
11		SHR5049	Cover, Lever Switch Knobs
12		SBD27	Knob, Lever Switches
13		SBN855–1	Knob, Volume control
14		SBN853	Knob, Balance, Bass, Treble Control
15		SBN857	Knob, Speakers, Rec Selector, Input Selector & Phono Selector
16		SNE59–1	Washer, Wave Type (Headphone Jack)
17		XCJ6P21B–A	Jack, Headphones
18		SHRA916–1	Latch, Power Indicator P.C.B. M'tg
19		ESA3334B	Remote Control, Input Selector Switch(S2)
20		ESA3333B	Remote Control, Rec Selector Switch (S3)
21		ESA3335B	Remote Control, Phono Selector Switch(S1)
22		FJT202B	Terminal, Ground 1 pin
23		SJF3029–1	Terminal, Input
24		SJP1103	Pin Plug, Phono Input Connection
25		SJF5807–1	Terminal, Speaker
26		SJT215	Terminal, Ground 1 pin
27		SGP1990B	Rear Panel
28		SJF4101	Terminal, Ground
29	△	SJS601	Socket, AC Outlet
30	△	**RJA9Y**	AC Cord, Power
31		SFHK040L	Bushing, AC Cord
32		SHS1009	Fiber, Cabinet
33		SHS6111	Fiber, Cabinet
34		SKC110H	Cabinet
35		SKU7990	Bottom Board
36		SKLA7–1	Foot
37		SJS5703	Socket, 7pin Lead Connection
38		SHG6051	Cushion, Cabinet (Rubber)
39		SUW1597	Stopper, Volume Knob
SCREWS, NUTS and WASHERS			
(1)		**XTS3+8B**	Screw, Tapping, ⊕ 3 x 8 (Front Panel)
(2)		**XNS8**	Nut, M8 (Volume, Balance, Selector etc.)
(3)		**XWC8B**	Washer, Toothed Lock, ø8
(4)		**XWC9B**	Washer, Toothed Lock, ø9
(5)		**XNS9**	Nut, M9 (Speaker Selector)
(6)		**XWV9**	Washer, Spring, ø9
(7)		**XNB12**	Nut, M12 (Headphones Jack)
(8)		**XTB3+8BFN**	Screw, Tapping, ⊕ 3 x 8 (Panel & P.C.B.)
(9)		**XWC3B**	Washer, Toothed Lock, ø3
(10)		**XWG3**	Washer, Plain, ø3
(11)		**XWC6B**	Washer, Toothed Lock, ø6
(12)		**XNG6E**	Nut, M6 (Ground Terminal)
(13)		**XTB3+8BFZ**	Screw, Tapping, ⊕ 3 x 8 (Rear Panel)
(14)		**XWC3B**	Washer, Toothed Lock, ø3
(15)		**XTB3+8BFZ**	Screw, Tapping, ⊕ 3 x 8 (Input Terminal)
(16)		**XTB4+8BFN**	Screw, Tapping, ⊕ 4 x 8 (Cabinet)
(17)		**XTB3+8BFN**	Screw, Tapping, ⊕ 3 x 8 (Bottom Board)
(18)		**XTV3+10BFN**	Screw, Tapping, ⊕ 3 x 10 (Feet)
PACKING PARTS			
P1		SPP651	Polyethylene Bag
P2		SPS2357–3	Pad, Left Side
P3		SPS2357	Pad, Right Side
P4		SPS2431	Pad, Corner
P5 [M] only		SPG2319	Carton Box
P5 [MC] only		SPG2321	Carton Box
P6 [M] only		SQF10297	Instructions Book, Printed Matter
P6 [MC] only		SQF10299	Instructions Book, Printed Matter

SU-V6 SU-V6

■ SERVICING PRECAUTION

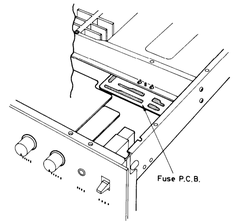


Fig. 1

When installing a removed fuse PCB, remove the bottom board and then install the base so that the line printed on the bottom of the base is parallel with the chassis lug.

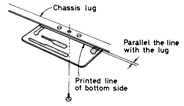


Fig. 2

■ ARRANGENEMTS OF WIRING AFTER REPAIRING

Distortion for the power drive amplifier circuit is delicately affected by the location of wirings. After repairing the circuit, form the lead wires into a loop shape as shown in fig. 3.

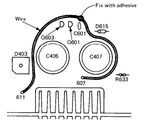
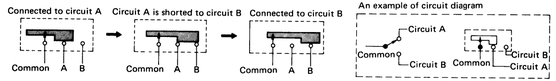


Fig. 3

Shorting Switch

This unit uses a shorting switch. As illustrated below, the circuit is shorted to the next circuit without being opened. In the circuit diagram, the shaded area represents the common terminal.



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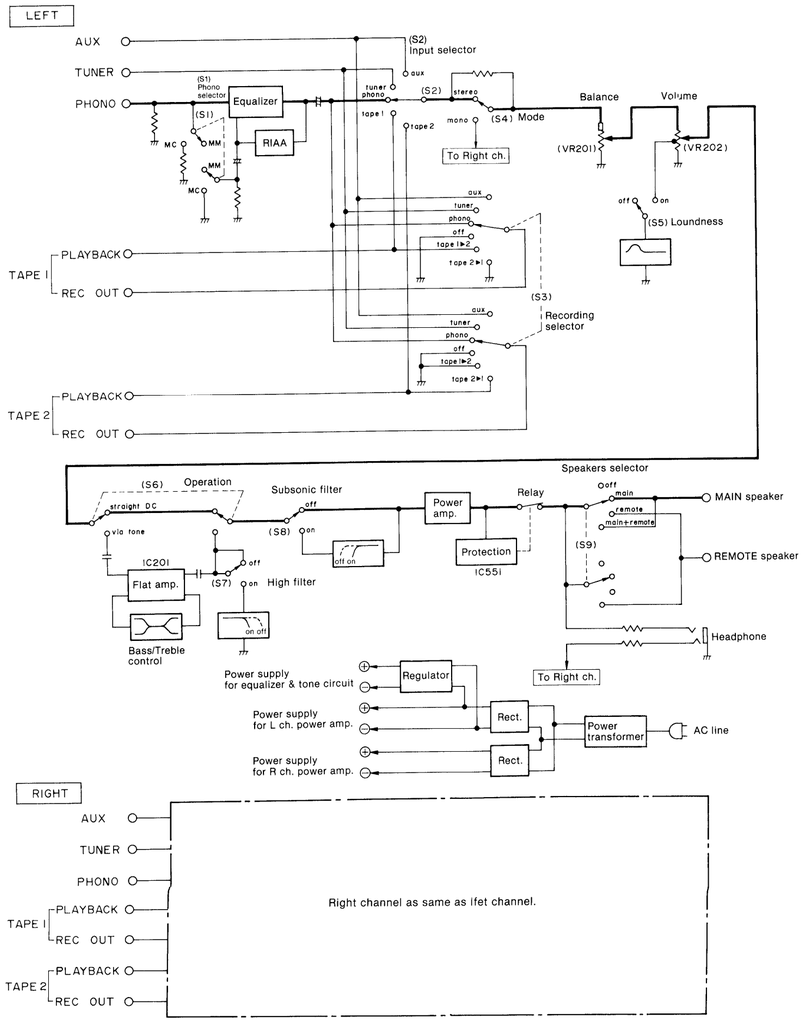
■ BLOCK DIAGRAM



■ RESISTOR AND CAPACITOR PARTS LIST

Ref. No.		Part No.	Part Name & Description
RESISTORS			
R101, 102		**ERO25CKF47R0**	Metal Film, 47Ω, 1/4W, ± 1%
R103, 104		**ERD25FJ8R2**	Carbon, 8.2Ω, 1/4W, ± 5%
R105, 106		**ERO25CKF4702**	Metal Film, 47kΩ, 1/4W, ± 1%
R107, 108		**ERO25CKF22R1**	Metal Film, 22.1Ω, 1/4W, ± 1%
R109, 110		**ERO25CKF4701**	Metal Film, 4.7kΩ, 1/4W, ± 1%
R111, 112		**ERD25FJ391**	Carbon, 390Ω, 1/4W, ± 5%
R113, 114		**ERO25CKF4701**	Metal Film, 4.7kΩ, 1/4W, ± 1%
R115, 116		**ERO25CKF4701**	Metal Film, 4.7kΩ, 1/4W, ± 1%
R117, 118		**ERO25CKF1200**	Metal Film, 120Ω, 1/4W, ± 1%
R119, 120		**ERO25CKF6802**	Metal Film, 68kΩ, 1/4W, ± 1%
R121, 122		**ERO25CKF5601**	Metal Film, 5.6kΩ, 1/4W, ± 1%
R123, 124		**ERO25CKF1200**	Metal Film, 120Ω, 1/4W, ± 1%
R125, 126		**ERD25FJ561**	Carbon, 560Ω, 1/4W, ± 5%
R127, 128		**ERD25TJ334**	Carbon, 330kΩ, 1/4W, ± 5%
R201, 202		**ERD25TJ394**	Carbon, 390kΩ, 1/4W, ± 5%
R203, 204		**ERD25FJ561**	Carbon, 560Ω, 1/4W, ± 5%
R205, 206		**ERD25TJ104**	Carbon, 100kΩ, 1/4W, ± 5%
R207, 208		**ERD25TJ474**	Carbon, 470kΩ, 1/4W, ± 5%
R209, 210		**ERD25FJ122**	Carbon, 1.2kΩ, 1/4W, ± 5%
R211, 212		**ERD25FJ392**	Carbon, 3.9kΩ, 1/4W, ± 5%
R217, 218		**ERD25TJ474**	Carbon, 470kΩ, 1/4W, ± 5%
R219, 220		**ERD25TJ223**	Carbon, 22kΩ, 1/4W, ± 5%
R221, 222		**ERD25TJ223**	Carbon, 22kΩ, 1/4W, ± 5%
R223, 224		**ERD25FJ392**	Carbon, 3.9kΩ, 1/4W, ± 5%
R225, 226		**ERD25TJ153**	Carbon, 15kΩ, 1/4W, ± 5%
R227, 228		**ERD25FJ272**	Carbon, 2.7kΩ, 1/4W, ± 5%
R251, 252		**ERD25FJ103**	Carbon, 10kΩ, 1/4W, ± 5%
R253, 254		**ERD25TJ183**	Carbon, 18kΩ, 1/4W, ± 5%
R255, 256		**ERD25TJ824**	Carbon, 820kΩ, 1/4W, ± 5%
R257, 258		**ERD25TJ824**	Carbon, 820kΩ, 1/4W, ± 5%
R259, 260		**ERD25FJ102**	Carbon, 1kΩ, 1/4W, ± 5%
R301, 302		**ERD25FJ101**	Carbon, 100Ω, 1/4W, ± 5%
R303, 304		**ERD25TJ104**	Carbon, 100kΩ, 1/4W, ± 5%
R305, 306		**ERD25TJ153**	Carbon, 15kΩ, 1/4W, ± 5%
R307, 308		**ERD25TJ153**	Carbon, 15kΩ, 1/4W, ± 5%
R309, 310		**ERD25FJ182**	Carbon, 1.8kΩ, 1/4W, ± 5%
R311, 312		**ERD25FJ222**	Carbon, 2.2kΩ, 1/4W, ± 5%
R313, 314		**ERO25CKF6801**	Metal Film, 6.8kΩ, 1/4W, ± 1%
R315, 316		**ERO25CKF6801**	Metal Film, 6.8kΩ, 1/4W, ± 1%
R317, 318		**ERD25FJ152**	Carbon, 1.5kΩ, 1/4W, ± 5%
R319, 320		**ERD25FJ152**	Carbon, 1.5kΩ, 1/4W, ± 5%
R321, 322		**ERD25FJ472**	Carbon, 4.7kΩ, 1/4W, ± 5%
R323, 324		**ERO25CKF1200**	Metal Film, 120Ω, 1/4W, ± 1%
R325, 326		**ERD25FJ152**	Carbon, 1.5kΩ, 1/4W, ± 5%
R327, 328		**ERD25FJ183**	Carbon, 18kΩ, 1/4W, ± 5%
R329, 330		**ERO25CKF3301**	Metal Film, 3.3kΩ, 1/4W, ± 1%
R331, 332		**ERD25TJ563**	Carbon, 56kΩ, 1/4W, ± 5%
R333, 334		**ERD25FJ270**	Carbon, 27Ω, 1/4W, ± 5%
R335, 336	△	**ERD25FJ101**	Carbon, 100Ω, 1/4W, ± 5%
R337, 338	△	**ERD25FJ101**	Carbon, 100Ω, 1/4W, ± 5%
R339, 340		**ERD25FJ392**	Carbon, 3.9kΩ, 1/4W, ± 5%
R341, 342		**ERD25FJ562**	Carbon, 5.6kΩ, 1/4W, ± 5%
R343, 344		**ERD25TJ473**	Carbon, 47kΩ, 1/4W, ± 5%
R345, 346	△	**ERD25FJ681**	Carbon, 680Ω, 1/4W, ± 5%
R347, 348	△	**ERD25FJ560**	Carbon, 56Ω, 1/4W, ± 5%
R349, 350	△	**ERD25FJ820**	Carbon, 82Ω, 1/4W, ± 5%
R351, 352		**ERD25TJ394**	Carbon, 390kΩ, 1/4W, ± 5%
R355, 356		**ERD25TJ823**	Carbon, 82kΩ, 1/4W, ± 5%
R403		**ERG1ANJ122**	Metal Oxide, 1.2kΩ, 1W, ± 5%
R451		**ERD25FJ332**	Carbon, 3.3kΩ, 1/4W, ± 5%
R453		**ERO25CKF9091**	Metal Film, 9.09kΩ, 1/4W, ± 1%
R454		**ERO25CKF5601**	Metal Film, 5.6kΩ, 1/4W, ± 1%
R455		**ERO25CKF1202**	Metal Film, 12kΩ, 1/4W, ± 1%
R456		**ERD25FJ102**	Carbon, 1kΩ, 1/4W, ± 5%
R457		**ERO25CKF1202**	Metal Film, 12kΩ, 1/4W, ± 1%
R501, 502		**ERD25TJ824**	Carbon, 820kΩ, 1/4W, ± 5%
R503, 504		**ERD25TJ824**	Carbon, 820kΩ, 1/4W, ± 5%
R505, 506		**ERD25TJ824**	Carbon, 820kΩ, 1/4W, ± 5%
R507, 508		**ERD25TJ824**	Carbon, 820kΩ, 1/4W, ± 5%
R551		**ERD25FJ102**	Carbon, 1kΩ, 1/4W, ± 5%
R553		**ERD25FJ822**	Carbon, 8.2kΩ, 1/4W, ± 5%
R554		**ERD25TJ224**	Carbon, 220kΩ, 1/4W, ± 5%
R555		**ERD25TJ333**	Carbon, 33kΩ, 1/4W, ± 5%
R556		**ERD25TJ153**	Carbon, 15kΩ, 1/4W, ± 5%
R557, 558		**ERD25TJ124**	Carbon, 120kΩ, 1/4W, ± 5%
R559		**ERD25TJ224**	Carbon, 220kΩ, 1/4W, ± 5%

Ref. No.		Part No.	Part Name & Description
R560		**ERG1ANJ681**	Metal Oxide, 680Ω, 1W, ± 5%
R561		**ERD25TJ223**	Carbon, 22kΩ, 1/4W, ± 5%
R601, 602		**ERD25FJ222**	Carbon, 2.2kΩ, 1/4W, ± 5%
R603, 604		**ERD25FJ222**	Carbon, 2.2kΩ, 1/4W, ± 5%
R605, 606	△	**ERD25FJ331**	Carbon, 330Ω, 1/4W, ± 5%
R607, 608	△	**ERD25FJ331**	Carbon, 330Ω, 1/4W, ± 5%
R609, 610	△	**ERD25FJ152**	Carbon, 1.5kΩ, 1/4W, ± 5%
R611, 612	△	**ERD25FJ122**	Carbon, 1.2kΩ, 1/4W, ± 5%
R613, 614	△	**ERD25FJ152**	Carbon, 1.5kΩ, 1/4W, ± 5%
R615, 616		**ERG1ANJ562**	Metal Oxide, 5.6kΩ, 1W, ± 5%
R617, 618	△	**ERD25FJ821**	Carbon, 820Ω, 1/4W, ± 5%
R619, 620	△	**ERD25FJ152**	Carbon, 1.5kΩ, 1/4W, ± 5%
R621, 622	△	**ERD25FJ821**	Carbon, 820Ω, 1/4W, ± 5%
R623, 624		**ERG1ANJ562**	Metal Oxide, 5.6kΩ, 1W, ± 5%
R625, 626	△	**ERD25FJ102**	Carbon, 1kΩ, 1/4W, ± 5%
R627, 628	△	**ERD25FJ102**	Carbon, 1kΩ, 1/4W, ± 5%
R629, 630		**ERD25TJ823**	Carbon, 82kΩ, 1/4W, ± 5%
R631, 632	△	**ERD25FJ5R6**	Carbon, 5.6Ω, 1/4W, ± 5%
R633, 634	△	**ERD25FJ221**	Carbon, 220Ω, 1/4W, ± 5%
R635, 636	△	**ERD25FJ2R2**	Carbon, 2.2Ω, 1/4W, ± 5%
R637, 638	△	**ERD25FJ2R2**	Carbon, 2.2Ω, 1/4W, ± 5%
R639, 640	△	**ERD25FJ5R6**	Carbon, 5.6Ω, 1/4W, ± 5%
R641, 642	△	ERF3RKR33	Non-Flammable, 0.33Ω, 3W, ±10%
R643, 644	△	ERF3RKR33	Non-Flammable, 0.33Ω, 3W, ±10%
R645, 646		**ERG2ANJ120**	Metal Oxide, 12Ω, 2W, ± 5%
R647, 648		**ERG2ANJ120**	Metal Oxide, 12Ω, 2W, ± 5%
R649, 650		**ERG2ANJ331**	Metal Oxide, 330Ω, 2W, ± 5%
R651, 652	△	**ERQ12HJ101**	Fuse Type Metallic, 100Ω, 1/2W, ± 5%
R653, 654	△	**ERD25FJ101**	Carbon, 100Ω, 1/4W, ± 5%
R655, 656	△	**ERQ12HJ331**	Fuse Type Metallic, 330Ω, 1/2W, ± 5%
CAPACITORS			
C101, 102		ECCD1H820K	Ceramic, 82pF, 50V, ±10%
C103, 104		ECKD1H681KB	Ceramic, 680pF, 50V, ±10%
C105, 106		**ECEA0JS222**	Electrolytic, 2200μF, 6.3V
C107, 108		ECQM1H473JZ	Polyester, 0.047μF, 50V, ± 5%
C109, 110		ECQM1H103JZ	Polyester, 0.01μF, 50V, ± 5%
C111, 112		ECQM1H332KZ	Polyester, 0.0033μF, 50V, ±10%
C113, 114	△	**ECEA25N3R3**	Non-Polar Electrolytic, 3.3μF, 25V
C115, 116		ECQM1H472KZ	Polyestor, 0.0047μF, 50V, ±10%
C117, 118		**ECEA1HS10R**	Electrolytic, 10μF, 50V
C201, 202		**ECEA50M1R**	Electrolytic, 1μF, 50V
C203, 204		ECQM1H272KZ	Polyester, 0.0027μF, 50V, ±10%
C205, 206		ECQM1H223KZ	Polyester, 0.022μF, 50V, ±10%
C207, 208		**ECEA50Z1**	Electrolytic, 1μF, 50V
C209, 210		ECQM1H123KZ	Polyester, 0.012μF, 50V, ±10%
C211, 212		ECQM1H683KZ	Polyester, 0.068μF, 50V, ±10%
C213, 214		ECCD1H220K	Ceramic, 22pF, 50V, ±10%
C215, 216	△	**ECEA25N3R3**	Non-Polar Electrolytic, 3.3μF, 25V
C217, 218		ECCD1H680K	Ceramic, 68pF, 50V, ±10%
C251, 252		ECQM1H153KZ	Polyester, 0.015μF, 50V, ±10%
C253, 254		ECQM1H123KZ	Polyester, 0.012μF, 50V, ±10%
C255, 256		ECQM1H104KZ	Polyester, 0.1μF, 50V, ±10%
C257, 258		ECQM1H124KZ	Polyester, 0.12μF, 50V, ±10%
C259, 260		ECCD1H181K	Ceramic, 180pF, 50V, ±10%
C301, 302		ECCD1H220K	Ceramic, 22pF, 50V, ±10%
C303, 304		ECKD1H821KB	Ceramic, 820pF, 50V, ±10%
C305, 306		ECCD2H220K	Ceramic, 22pF, 500V, ±10%
C401, 402	△	ECKDMY103PF	Ceramic, 0.01μF, 125VAC, +100 −0%
C405, 406		ECET56V822U	Electrolytic, 8200μF, 56V
C407, 408		ECET56V822U	Electrolytic, 8200μF, 56V
C451, 452		**ECEA1JS4R7**	Electrolytic, 4.7μF, 63V
C453, 454		**ECEA1VS330**	Electrolytic, 33μF, 35V
C457, 458		**ECEA1ES101**	Electrolytic, 100μF, 25V
C459		**ECEA1CS330**	Electrolytic, 33μF, 16V
C551		ECKD1H102MD	Ceramic, 0.001μF, 50V, ±20%
C552		**ECEA50Z3R3**	Electrolytic, 3.3μF, 50V
C553	△	**ECEA16N100**	Non-Polar Electrolytic, 100μF, 16V
C554		**ECEA1CS330**	Electrolytic, 33μF, 16V
C601, 602		ECKD1H103MD	Ceramic, 0.01μF, 50V, ±20%
C603, 604		ECKD1H103MD	Ceramic, 0.01μF, 50V, ±20%
C605, 606		ECCD1H100K	Ceramic, 10pF, 50V, ±10%
C607, 608		ECCD1H100K	Ceramic, 10pF, 50V, ±10%
C609, 610		**ECEA1HS100**	Electrolytic, 10μF, 50V
C611, 612		ECQM1H104KZ	Polyester, 0.1μF, 50V, ±10%
C613, 614		ECQM1H104KZ	Polyester, 0.1μF, 50V, ±10%
C615, 616		ECKD1H681KB	Ceramic, 680pF, 50V, ±10%
C617, 618		ECKD1H681KB	Ceramic, 680pF, 50V, ±10%

■ REPLACEMENT PARTS LIST (Electric Parts)

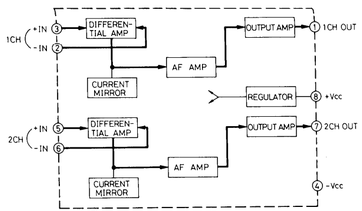
Notes: 1. Part numbers are indicated on most mechanical parts.
Please use this part number for parts orders.
2. △ indicates that only parts specified by the manufacturer be used for safety.

Ref. No.		Part No.	Part Name & Description
INTEGRATED CIRCUITS			
IC101		SVINJM4559DS	IC, Equalizer
IC201		AN6552F	IC, Tone Amplifier
IC551		SVITA7317P	IC, Protection & Operation Amplifier
TRANSISTORS			
Q101~104		2SK170–GR	Transistor, Phono Input Differential Amp. (Use in ranks GR or BL) [FET]
Q301, 302		SVIUPA68H–K	Transistor, Pre Drive Buffer (Use in ranks K or L) [FET]
Q303, 304		2SA995N–G	Transistor, Current Mirror (Use in ranks F or G)
Q305, 306		SVIUPA74V–P	Transistor, Pre Drive Amplifier (Use in ranks P or R)
Q307, 308		2SA921–T	Transistor, Emitter Follower (Use in ranks R, S or T)
Q309, 310, 615, 616		2SA1124–R	Transistor, Pre Drive Amplifier (Use in ranks R or S)
Q311, 312, 613, 614		2SC2632–R	Transistor, Pre Drive Amplifier (Use in ranks R or S)
Q451, 452		2SK34–D1	Transistor, Current Stabilizer [FET]
Q453		2SD381A–L9	Transistor, Positive Voltage Control (Use in ranks K, L, L9 or M)
Q454		2SB536A–L9	Transistor, Negative Voltage Control (Use in ranks K, L, L9 or M)
Q455, 601, 602		2SC1815–Y	Transistor, Regulator & Current Limiter (Use in ranks Y or O)
Q456, 603, 604		2SA1015–Y	Transistor, Regulator & Current Limiter (Use in ranks Y or O)
Q605~608		2SD661–S	Transistor, Bias Supply (Use in ranks R or S)
Q609~612		2SB745–S	Transistor, Bias Supply (Use in ranks R or S)
Q617, 618		2SC1913–R	Transistor, Drive Amplifier (Use in ranks Q or R)
Q619, 620		2SA913–R	Transistor, Drive Amplifier (Use in ranks Q or R)
Q621, 622		2SD845–R	Transistor, Power Amplifier (Use in ranks R or O)
Q623, 624		2SB755–R	Transistor, Power Amplifier (Use in ranks R or O)
DIODES			
D301, 302, 605~608		**MA162A**	Diode, Bias Supply
D303, 304		**MA27A1**	Diode, Bias Supply
D401		LN831RP	Light Emitting Diode, Power Indicator
D402		**MA162A**	Rectifier, Light Emitting Diode
D403, 404	△	SVDS4VB20	Rectifier
D451		SVDMZ306A2	Diode, 6V Zener
D551, 601~604		**MA162A**	Diode, Current Limiter
D552		**SVDSR1K2**	Diode, Pulse Cancel
D609~616		**20A90**	Diode, Synchronous Bias Switching

Ref. No.		Part No.	Part Name & Description
COILS and TRANSFORMER			
L601, 602		SLQY15G–3P	Coil, Power Amplifier Output Choke
T401	△	SLT5Q107	Transformer, Power
VARIABLE RESISTORS			
VR201		EWKK4A085252	Balance Control, 200kΩ (BH)
VR202		EWFNUA026815	Volume Control, 100kΩ (B)
VR203		EWK36F25C15S	Treble Control, 100kΩ (C)
VR204		EWK36F25C15S	Bass Control, 100kΩ (C)
R353, 354		EVMH9GA00B53	DC Balance Adjustment, 5kΩ(B)
R657~660		EVTR4SA00B13	Clamp Voltage & IcQ Adjustment, 1kΩ(B)
THERMISTERS			
TH601, 602		ERTD2FHL103S	Thermister, Thermal Compensation, 10kΩ
COMPONENT COMBINATIONS			
Z402, 403		EXRFS203ZS	Component Combination, 0.01μF (X2)
FUSES			
F1	△	XBA1F60NU14	Fuse, 6A (125V)
F2	△	XBA2F06NU100	Fuse, 600mA (250V)
RELAY			
RLY1	△	SSY69	Relay, Muting & Protection
SWITCHES			
S1		ESD80540	Switch, Phono Selection
S2, 3		ESA2682	Switch, Input & Recording Selection
S4, 5, 7, 8		SSL145	Switch, Low/High Filter, Mode & Loudness
S6		SSL129	Switch, Operation
S9		SSR145	Switch, Speaker Selection
S10	△	SSL133	Switch, Power Source
LAMP			
PL	△	XAMR73S350	Lamp, New Class A Badge, 6.3V 250mA

■ BLOCK DIAGRAM OF IC'S

IC101 (SVINJM4559DS) Equalizer
IC201 (AN6552) Tone



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